in the vicinity of Tarpon Springs, but Mr. Atkins found them at Key West rather commonly on April 28, 1887, and again saw them on May 3 of the same year.

Turdus aonalaschkæ pallasii. HERMIT THRUSH.—Common migrant and winter resident on the Gulf coast. Mr. Atkins found it common in winter at Punta Rassa and has a single record of it at Key West in January, 1889.

Merula migratoria. AMERICAN ROBIN.—An irregular migrant, but present in small numbers almost every year, and sometimes abundant. Appears late in December, and remains till the 10th of March which is the latest record. Mr. Atkins says it was irregular in its visits to Punta Rassa, but common at Key West in December and January, 1887.

Sialia sialis. BLUEBIRD.—A rather common resident, and breeds, at all points I have visited on the Gulf coast of Florida. Mr. Atkins has furnished me with no notes regarding the species.

In this paper I have attempted to bring down to date the latest information regarding the birds of the region in question, but notes accumulated which treat of the species dealt with in the preceding parts (the publication extending back some two years) seem worth presenting, and I hope to offer in an early number of 'The Auk' a synopsis of the series, with such additional information as will bring the latest knowledge obtained before the readers of this journal.

ON THE CHANGES OF PLUMAGE IN THE BOBOLINK (*DOLICHONYX ORYZIVORUS*).

BY FRANK M. CHAPMAN.

THE MARKED seasonal changes which occur in the plumage of the Bobolink have ever been made a prominent fact in the life-history of this well-known bird, but I am not aware that the subject has been studied with a complete series of specimens representing each stage of the bird's plumage as it appears throughout its range. For this reason, perhaps, we may account for the generally accepted statement, that the change in the male from the female-like plumage of winter to the black and yellow costume of spring, occurs without loss of feathers but by a change

of color in the feathers themselves, accompanied by a wearing away of their more exposed portions, resulting in the breeding dress with which we are familiar. That this is in part true, there can be no doubt, but that this change is attended by a complete moult, is apparently proved by the material before me.

Before further discussing the subject it may be well to briefly review the seasonal and sexual costumes assumed by the Bobolink. The nestlings of both sexes resemble each other and differ from the bird of the year in having the entire plumage, particularly below, of a more buffy color; there is a necklace of faint dusky spots across the breast and the flank streaks are almost indistinguishable. This plumage is soon followed by the well-known Reed-bird dress in which, perhaps, the males *average* slightly brighter. The black streaks on the flanks and sides are now clear and well defined, the feathers of the breast have generally a small, black, basal shaft-streak, and a spot of the same color occasionally appears on the feathers of the throat. In the winter this plumage by fading and abrasion loses much of its brightness and the bird then closely resembles the worn breeding female. It is not necessary in this connection to describe the costumes of the adult female, nor have I material to fully discuss the subject. As far as I know, the adult bird in the fall cannot be distinguished from birds of the year.

In calling attention now to the main object of this paper, the costumes of the male bird, without at this moment dwelling on his appearance in full nuptial dress, we will first consider the change which follows the close of the breeding season. The bird now undergoes a complete moult, losing his entire plumage even to remiges and rectrices, and acquiring a new dress which at first glance is very similar to that of the bird of the year. Closer examination, however, shows well-marked differences. In the adult bird the feathers of the crown, particularly those of the median line, have larger black areas and are less regularly bordered with brownish: the secondaries are not terminated with a narrow edging of white, and the tertials lack the whitish border which is generally seen on those of the young bird. On the sides and flanks the markings are somewhat heavier but resemble those of the young bird, while the black basal areas on the feathers of the throat and breast are larger and more numerous, in some cases occupying the basal three fourths of the feather,

the buff then appearing as a terminal and slightly lateral border. This plumage then, while more nearly like that of the young bird, is in a measure intermediate between it and the breeding male, and we can readily understand how an examination of this plumage alone would easily mislead one into supposing the bird was acquiring the black male dress by a change of pigment in the feathers, to be followed by a wearing away of their exposed yellowish borders.

Our interest now centres in an adult male specimen, No. 32,783 of the American Museum collection, taken March 1, 1886, by H. H. Smith at Corumbà in southwestern Brazil. This bird is undergoing a complete moult, but has nearly acquired a new plumage, its exact condition being as follows: Above, the tertials, four secondaries, the first primary and alula of either wing belong to the old plumage, the balance is entirely new, but the scapulars, some of the wing feathers, and the tail have not completed their growth. The plumage of the under surface is more nearly complete, the old feathers being confined to the sides of the throat, abdomen, and flanks; in its dorsal plumage this bird bears a striking resemblance to the adult fall male before described. The crown lacks a median line, but the feathers have an even wider border of brown which, however, is now strictly terminal. The feathers of the nuchal band are without black shaft streaks and the exposed portions are of a deep rusty brown color, fading gradually to a white base; the interscapulars are black with an almost complete border of brownish yellow, similar, therefore, to those of the fall bird, but the black is deeper and of greater extent; the scapulars which have appeared are white for their basal three fourths, with the terminal portion brownish yellow or olivaceous-brown; the wings and coverts, referring now to the new plumage, are similar to those of the adult spring male but the feathers have wider and darker borders; the lower back is in poor condition, but apparently resembles that of the breeding bird; the feathers of the rump resemble the scapulars already mentioned; the tail, so far as it has appeared, agrees with that of the spring male. Below, the bird's plumage is most interesting; its general appearance may be described as black, heavily veiled with yellow,—all the feathers having a long terminal fringe of this color, which in no instance descends to the side of the feather. On the feathers of the breast this fringe averages in

width .15 inch; the centre of the abdomen is still occupied by feathers of the winter plumage, which are faintly bordered with yellowish; in the flanks still remain a few longitudinally striped feathers of the winter dress, but these are being replaced by black feathers terminally fringed similarly to those of the breast. Allowing for the slight and unimportant changes a completion of the moult will cause, it will be seen that we have here a bird which, although it has acquired its final spring plumage as far as feathers are concerned, still differs greatly from the black, yellow and white Bobolink we are accustomed to see. My material fortunately illustrates the succeeding changes which occur before the bird may be said to have gained its perfect nuptial dress.

An examination of the brown- or yellow-tipped feathers shows that their barbs are separated for at least their apical third, and that the brown or yellow color commences at or near the point of separation. Being thus without the mutual support furnished by an interlocking of their delicate barbules, these fringe-like terminations soon disappear before the constant wear and tear to which they are subjected. As we might suppose there is some regularity in the manner in which succeeding parts of the bird's plumage lose these terminal barbs, and they disappear first from the more exposed portions and persist longest where they receive the most protection. The head and breast, therefore, seem to be the first to become fully black, while the most perfect specimen before me (one of several kindly loaned by Dr. A. K. Fisher) still shows traces of yellow on the sides, flanks, and lower abdomen. In the nuchal collar, scapulars, and rump abrasion is evidently assisted by a fading of the more exposed portion of the feather.*

All these changes are closely correlated with a change in the color of the bill. In the Corumbà specimen it resembles that of the fall and winter bird; the mandible is reddish brown, the maxilla flesh color. The final black first appears on the anterior portion of the mandible and reaches its base before a similar

*While the loss of these delicate terminations is largely effected by actual abrasion, or even by the mere action of flying, it is evident that, losing their vitality, and lacking protection, they become in a measure deciduous, and drop off without the assistance rendered by a mechanical abrasion. The subject is an important one and deserving of more attention than has been accorded it. A similar change occurs in many other genera, for instance: *Otocoris, Agelaius, Scolecophagus, Passerina, Junco, etc.*

change is effected in the color of the maxilla, which, however, does not attain the same degree of jet blackness.

The second complete moult of the year is now finished, and again we have the rollicking Bobolink of our fields and meadows.

OBSERVATIONS ON SOME OF THE SUMMER BIRDS OF THE MOUNTAIN PORTIONS OF PICKENS COUNTY, SOUTH CAROLINA.

BY LEVERETT M. LOOMIS.

(*Concluded from p. 39.*)

29. **Cyanocitta cristata.** Blue Jay.—It is remarkable that this bird, in the mountains, seeks a home on the wild and remote summits away from the settlements, while at Pickens Court House, only a dozen miles away, it is a familiar inhabitant of the shade trees of the streets and door-yards.

30. **Corvus corax** ——? Raven. — The Ravens of this district are eminently birds of the mountain tops, venturing into the settled valleys only during brief excursions in search of food. They are said to descend to these lower grounds to feed on carrion more freely in winter than in summer. Their more frequent presence at the former season is ascribed to increased scarcity in the food-supply, but probably they are actually more abundant, re-enforcements coming from the higher points of North Carolina. Whenever the chance offers, their nests are broken up and the young destroyed, but in spite of persecution they continue to hold their own, and may justly be ranked as tolerably common. (See also Auk. VI, 277.)

31. **Corvus americanus.** American Crow. — Occurs as commonly here as elsewhere in the up-country during summer.

32. **Spinus tristis.** American Goldfinch. 'Lettuce-bird.'—Rather common, especially in the Oolenoy Valley.

33. **Spizella socialis.** Chipping Sparrow. — A very common songster in suitable situations. On Mt. Pinnacle its range extends along the barren ridges, among scattered pines, to the heavy hardwood growth crowning the summit.

34. **Spizella pusilla.** Field Sparrow.—In the Oolenoy Valley these Sparrows are very common, but on the heights above they are sparingly distributed, being limited to the clearings. Their musical efforts exhibited the peculiarities characteristic of the species in the lower country.